# Special Issue: Current LCA-ISO Activities

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# Foreword

## Development of Life Cycle Thinking

During the last decades, our modern industrial society has faced one of the biggest challenges of mankind in history: the increasing consumption of resources and pollution of the environment have become a global problem. Although the knowledge about these facts is widespread, most people continue to consider these environmental issues inadequately. People often prefer the more convenient and frequently cheaper method, regardless of the severe effects which this behavior may cause. This way of thinking cannot only be found in private life, but is also common in industry throughout the world. In Industry, the opinion is often shared that ecological decisions and free enterprise economy, as well as the economic interest of profit maximization, are impossible to combine.

The current economic situation of many companies and their need for strong core competencies, as well as the increasing sensitivity of their clients for ecological behavior, force industry to deal with environmental questions and problems. The public discussion about the sense and nonsense of the production and usage of different products or services shows the need for an instrument that allows designers and the public to investigate different techniques, materials, products and services for their environmental effects.

Although one may consider that Life Cycle Assessment was founded by LAVOISIER with his famous principle of conservation of mass, the method was actually developed in the '70s as one major outcome of the oil crisis. With all consequences being analyzed, the availability of natural resources could obviously not be considered independently from all other global environmental impacts: this can be considered as the earliest formulation of one of the basic principles of Life Cycle Assessment.

Nevertheless, Life Cycle Assessment was really developed and used in companies starting in the 80's in order to respond to the companies responsibility and interest of consumers for "greener" products. It was becoming increasingly obvious that no criteria considered alone would ever be sufficient to qualify a true improvement in terms of benefits for the environment. At that time, the "Society for Environmental Toxicology and Chemistry" (SETAC) became the most outstanding discussion and methodology development platform. SETAC was originally founded in the US, but a European department was soon developed.

Life Cycle Assessment was developed to meet the specific needs raised by organizations trying to embrace the protection of the environment in the development and improvement of their products.

Therefore, the use of Life Cycle Assessment also grew and widened until the first mention of this method appeared, as a means to support the environmental claim of superiority of particular products over other competing ones.

At that time, in the early '90s, the clarification of this methodology had become a most urgent item; some uses and sometimes abuses of the results of Life Cycle Assessment, eventually jeopardized the credibility of this useful tool.

## ISO Standards

This concept paved the way for introducing ISO standards, specifying requirements to ensure transparency over the whole process. This is considered to be a key condition for establishing confidence, not only between the commissioner and the practitioner of the study, but also with all parties concerned to whomever the results are communicated.

A Life Cycle Assessment (LCA) is only one existing tool or method amongst many others, like ecological (eco) audits, energy balances, mass balances or toxicity-surveys of single materials that are currently used to evaluate environmental damages.

The entire discussion about methods and techniques of environmental questions is dominated by the international efforts on this subject. The fact alone that the International Standardization Organization (ISO) has been dealing with this issue shows its immense importance to them. All stan-



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dardization activities concerning the environment are summarized under the heading of the TC (Technical Committee) 207. Six different main emphases are controlled by the so-called Subcommittees (SC). In detail, these main points are:

- environmental managing tools
- ecological audits
- product labeling
- the assessment of the environmental performance of products and processes
- life cycle analyses and
- a group that deals comprehensively with the choice and definition of terms

Figure 1 shows the structure of ISO TC 207.

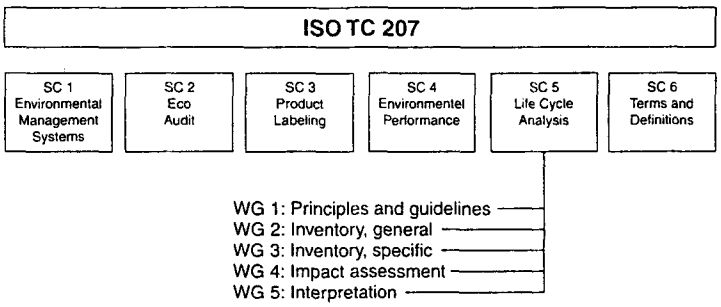


Fig. 1: Structure of ISO TC 207

## Standardization of Environmental Balances: ISO 14040

For LCA, especially Subcommittee 5 (SC 5) is substantial. This SC itself is again divided into five so-called Working Groups (WGs):

WG 1 establishes the *basic document* for standardization of environmental balances (ISO 14040). In this connection, all requirements and the scope of the balance and of the practitioner are defined. Building up on this paper, standardization papers of all the other WGs are also created.

WGs 2 and 3 deal with the **Inventory (ISO 14041)**, i.e. the *description and survey of the momentary state*. The selection of a general and a specific WG is only theoretical. Both groups work together on the same standardization draft. Only further in the future will each of the WGs turn to specialties of the balance and the processes of several materials.

WG 4 considers all themes of the logging of **environmental impacts** and their **valuation (ISO 14042)**. This WG deals especially with the *interpretation and subsequent treatment of the results of the inventory*. In contrast to the ISO structure which does not distinguish between Impact Assessment and Valuation, many national committees and experts claim to maintain strict separation.

WG 5 turns to the main goal of environmentally related balances, possible *improvements and innovations*. At present, nobody has yet begun to work on this topic. This WG is still in the phase of being defined in the summer of 1997.

A further example is that the results of the Life Cycle Assessment are to be publicly produced to support any declaration suggesting that a product A is superior to a product B from the standpoint of its impact on the environment. In such a case, the standard makes it compulsory that complete external checking of the study's validity be carried out.

Three examples to the provisions of **ISO 14040** show that, in spirit and purpose, it is intended to avoid such abusive situations or applications that in the past could have led to thinking that the method was either useless or dangerous. Consequently, the standard should represent both:

- a **guarantee for the companies** which are willing to use life cycle assessment, giving them credit for choosing progressive actions in the ecological management of their products, and
- a **defense of their competence**, ensuring that any public statement comparing a product with another has previously been reviewed in an open, documented and verified manner.

Naturally, ISO 14040 draft standard also specifies the methodological framework for life cycle assessment and provides requirements for the application of the main concepts of the analysis, beginning with its successive phases. Various drafts for this first standard have been submitted to the sub-committee. The final draft was approved during the meetings held in Rio de Janeiro, Brazil in March 1996. Such a decision now allows the document to be sent for voting to all the ISO Member Bodies in May and, consequently, the ISO 14040 is to be published in '97.

## Subsequent Standards

It is planned that such documents provide requirements and recommendations for completing the various phases of a Life Cycle Assessment – although more from a technical standpoint – assuming that ISO 14040 has solved the deontological questions.

### Inventory: ISO 14 041

The first of these more technical standards will be a *method for conducting an inventory*; it will cover the **first two phases** of any life cycle assessment:

**1. The definition of the objective and scope of the study.** This phase is essential for checking the validity of the rest of the assessment, the magnitude and depth of which, and hence, the costs, will depend on the client's ambitions and to the type of decisions under examination. It is easy to imagine that a life cycle assessment whose intention is to define a national or regional policy for waste recycling or treatment will have to be based on a huge quantity of data, with many precautions as to the limits of the system, the rules to be adopted for flow allocation, etc. It will be very different in scope from a study performed by a company wanting to optimize the volume, power input and materials of an electrical appliance.

As a consequence, life cycle assessment is dependent on its objective. The transparency requirement is essential: the client requesting the study will have to openly declare what the true intention is to the individual who will carry out the assessment. In the latter example, it is easy to see that there will be problems if the company neglects to inform the individual carrying out the study that its intention is to use the results for comparative publicity in the competitive field.

Those reasons which were not well understood in the first experiences of the life cycle assessment justify that special attention be paid to that particular phase of the assessment in the future.

**2. Inventory.** ISO 14041 will specify technical requirements and recommendations for that phase: Which rule is to be adopted for deciding that a flow is depreciated, how to allocate flows between various functions, how to deal with coproducts, the various types of recycling, etc.

The relevant draft is being prepared through a joint action by WG 2 and 3 until ISO 14041 is published, probably at the end of 1997. Once the draft is approved by the subcommittee, it is planned that WG 3 will operate independently on a guidance document giving an enhanced and illustrative understanding of the ISO 14040 standard series.

### Life Cycle Impact Assessment: ISO 14 042

An explanation is required at this stage to justify the complete title of the technique, i.e. potential impact assessment. The concept of "potential" has a very precise meaning. If finally represents an approximation of the real impact which is maximized for precaution's sake. The reason is that the exact relationship between the flows and the real impact cannot be modeled at a finer level of detail. It cannot reflect 100 % of the scatter effects in time or space, nor the effects of the threshold beneath which a flow has zero effect. The potentiality here represents the capability of causing a damage (hazard), as well as the probability of the damage (risk).

Much discussion is still required on this technique within WG 4 before a first committee draft can be produced. The publication of the standard is therefore planned for approximately 1998.

### Interpretation of Results: ISO 14043

The development of a standard for result interpretations does not correspond to the solution of very technical problems. Moreover, its objective is to show the links which may exist between life cycle assessment and the other techniques of environmental management, and to explain the limits of LCA professionals' responsibilities in relation to the use that is made of their studies. The publication of ISO 14043 could occur in 1998.

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## Life Cycle Impact Assessment

**Konrad Saur**

The "Impact Assessment" of Life Cycle Assessment is a broad topic which is currently being discussed controversally. In the past, impact assessment methods were developed in order to help to derive information from the inventory and in order to attain informed decision making. Due to the fact that volume and content of the Life Cycle Inventories has grown significantly with time, it has become more and more difficult to draw conclusions directly. Thus, impact assessment was invented. Different methodologies were published and SETAC founded working groups on this item in both North America and Europe. Today, "Impact Assessment" is a research topic.

With time, people have begun to understand that the impact assessment idea covers more than only the concentration of information coming form the inventory. The more people who have started working with impact assessment, the more the added value of this methodology has come to the surface. Today it is broadly accepted that impact assessment is the only interface of LCA with the environment. Dealing with the potential effects and impacts of the interventions identified in the inventory, impact assessment offers a great opportunity to enlarge the conclusions which can be drawn from the whole LCA and offers a truly iterative nature by setting requirements and providing help as to which data has to be collected due to the respective relevance to the environment.